IX. Controlling invasive species

Invasive species are plants, animals, or pathogens that rapidly take over a new location and alter the ecosystem. They are non-native species, but many natives can be weedy and troublesome, especially when growing out of their natural context. Often these species spread because there are no natural predators, competitors, and processes in their new environment to keep their numbers in check. People are often the main vectors for moving invasives around.

Human-created conditions causing invasive spread are:

- introducing exotic species (from other regions or countries)
- disrupting the delicate balance of native ecosystems by changing environmental conditions—e.g., stream sedimentation, ditching, building roads) or by restricting or eliminating natural processes (fire for example); in such instances, even some native plants and animals can become invasive; and
- spreading invasive species through various methods. Some examples:
  - moving watercrafts from water body to water body without removing invasive plants and animals;
  - carrying seeds of invasive plants on footwear or pet's fur;
  - mowing along roadsides;
  - importing firewood and leaving in campgrounds;
  - driving and biking with invasive seeds in tire treads.

Kill the invaders attitude!

Sometimes it's tempting to think about removing all of the invaders on a particular property before doing anything else. This may or may not be the best approach. Think about the created conditions that fostered the invaders' spread in the first place. The presence of invasives often indicates something larger that is wrong and needs to be dealt with first. For example, a large patch of reed canary grass in the middle of a nice sedge meadow might be an indicator of altered hydrology. To solve the problem, work should be focused on solving the major problem (if possible) before or along with trying to spray the reed canary grass. Or maybe fire needs to be reintroduced to top kill shrubs, increasing light levels and stimulating germination of native species. Try to establish conditions that will allow native plants and animals to thrive. Consult local experts or literature for more help.

How do I attack invasives? They are everywhere!

It is easy to feel overwhelmed when walking through a site and observing how many invasives are present. Don't be afraid to lower the bar. It might not be possible to wipe out all of the invaders in a specific State Natural Area. Look at the site and determine which areas are worth working in. Worthwhile areas are those that contain high diversity, few or easy to control invasives, and easy access. They might contain rare and endangered plants and animals. Think about prioritizing and focusing your efforts on invaders in the quality areas first. Once these areas look good, you can move on to other areas. Weigh what you can take on. Plan to devote some effort to controlling invaders in new areas for the long term. They will get easier to control with time, but some years may be harder and may require follow-up for 3-5+ years. Come up with a plan that states clear goals, assess progress periodically, and adapt the plan accordingly. More information follows in the Yearly management objectives section.

Dramatic landscape changes

Dramatic landscape changes are changes that are large enough to affect the whole local ecosystem. They are the big picture goals of most restorations—going from agriculture field to prairie, oak woods to savanna. Catalysts of this change can range from blow downs to fire to brush cutting. But dramatic changes may not always be good. There may be a huge change in canopy cover with only a few invasives. Those invasives may be primed and ready to fill the gaps opened up from a closed canopy system. Be mindful of the challenges presented by large- scale changes beforehand.

For example, cedar removal is essential for hill prairie preservation, but sometimes it can cause a lot of problems for many years. Sumac, thistles, knapweed, and sweet clover may move in to cover bare ground patches. Failure to remove a small number of persistent invaders (like sweet clover) may mean you will be dealing with a seed bank and germinating individuals for many years. Other times native prairie naturally comes back without any coaxing. It is important that you are aware of what may fill in and the work it will take to ensure all your work is not lost. Think about planning follow-up work days in areas you make large-scale changes. Always be thinking about the future goal and how best to get there but be ready for the unexpected.

A. Methods to control invasive species

Girdling

This method removes the cambium layer from the stem of a tree. It will cut the roots off from the supply of sugars produced from the leaves, causing a slow death. The tree may leaf out for a year or two before it dies since water and nutrients are still able to flow to the leaves from the roots through the xylem. It is moderately effective on aspen clones, ironwood, box elder, etc. It is a reliable way to control these trees without using herbicide. It should be done below the lowest live branch in spring-early summer after leaf out but before mid-summer.

Girdling can also be done together with the use of herbicide for the species that do not die without herbicide. It can be an efficient way to kill larger trees without a large amount of slash buildup right away. But beware; there will be dead trees for many years before they fall down.

Hand pulling

The pros of hand pulling include being cheap, easy, no tools required, and visible progress. Cons are soil disturbance, bringing up seeds from the seed bank, being labor intensive, pulling desirable plants as well, not getting the entire root. It is possible to hand pull many invaders. There is usually a time of year when hand pulling is easier due to smaller plant roots or ease of finding the invasive.

Digging

This is a more disruptive method than hand pulling and can be very effective on taproot species like wild parsnip. For wild parsnip and some other taproot species, it is possible to cut below the root crown (just below the soil) to achieve effective removal. Digging the entire root will leave a more noticeable disturbance and should be used sparingly on species that can be controlled with other methods.

Mowing

Mowing can be effective at controlling some biennial plants that put all of their resources into flowering and producing seed in their second year before dying. The drawback is that mowing can be non-selective and can damage non-target species, especially large-scale mowing. Some examples of biennials mowing may target are sweet clovers, Japanese hedge parsley, wild parsnip, some thistles, etc. Mowing timing is crucial and specific to the species, but it should be mowed at peak flowering before seeds are mature. Repeated mowing may be needed if cut stems resprout. Mowing is also an option to top kill brush. Repeated mowing can decrease the cover of brush species like sumac, honeysuckle, and dogwood. Mowing can often be done with mechanical equipment, which can make it more efficient than hand pulling.

Herbicides

Herbicides can be applied in a variety of ways and can be very efficient and effective at controlling invasives. They are essential to control some species. Always read the pesticide label and follow directions. Anyone applying herbicide to aquatic areas must be a certified applicator in Wisconsin. See Section XI, “Herbicides”.

Prescribed fire

Many of Wisconsin’s plant communities relied on fire before the landscape was fragmented by European settlement and fires were extinguished. Prairies, wetlands, savannas, and oak woodlands are all dependent on fire to top kill brush, decrease canopy cover, stimulate natives, release nitrogen and other nutrients, warm the soil, etc. Fire can be a very efficient tool for invasive removal because a large area can be impacted with minimal effort. If favorable fuels are present (oak leaf litter, grasses), fire can drastically change the landscape. Fire will not be a magical cure because many undesirable areas do not have enough fuel to burn and undesirable woody plants will resprout, but it can be a great start. Find more specific species effects discussed in the Species section immediately below.

New methods

Keep learning! There are always new methods out there to be discovered, those listed above are not exhaustive!

B. Species

The following information is boiled down to the most important basics. This section is not meant to be exhaustive or authoritative. While these methods have been obtained through research and experience, they may not work in all situations and more effective methods may exist or be developed. Please use other resources, consult experts, and make observational changes to correctly identify invasives and determine the best management method. **For the most comprehensive, up-to-date, and research proven methods in Wisconsin, we recommend checking the UW Extension weed science page at http://fyi.uwex.edu/weedsci/ and searching for the specific invader.** There are factsheets for many of the invaders listed below with information on other methods and herbicides. Also see Appendix B: Herbicide application rates chart, for a basic but more organized chart of effective herbicides and rates.

Autumn Olive (*Eleagnus umbellata*)

Damage to SNAs

- Small tree that is a persistent spreader and quick grower in open areas, especially rocky and sandy sites.

- Spread - Birds eat the berries and disperse seeds (often from perches).

Control

- Cut stem - Cut autumn olive and apply an oil based herbicide like triclopyr in fall and winter.
- Other herbicide methods are also successful- basal bark treatment or foliar spray with triclopyr.
- Prescribed fire - Burning in areas with sufficient fuel load to carry fire kills young seedlings. Repeated prescribed burning can topkill trees and resprouts, setting them back.

Aspens (*Populus spp*.)

Damage to SNAs

- Aspen are native to all of Wisconsin but have increased their range (especially in southern Wisconsin) to include areas where commonly occurring fires were ceased. They now occur in previously open areas such as hill prairies, wetlands, barrens, and wet prairies.
- Spread - Aspen are clonal trees and spread via extensive root systems as well as some seed production.

Control

- Girdling - Removing the outer bark in the spring and summer (May- June) of all trees in the clone is effective at separating the leaves from the roots and stopping the flow of sugars to the root system. The trees may take a year or two to die, but typically do not resprout or sucker.
- Cut stem - Using a solution of aminopyralid and triclopyr with oil on cut stems (all included in the clone) can be effective.
- Foliar spray - Aminopyralid and triclopyr in water can control any small resprouts that occur.

Black Locust (*Robinia pseudoacacia*)

Damage to SNAs

- Usually invading open or partially shaded areas, often in sandy soil, black locust is an aggressively spreading, clonal species that grows into large trees very quickly and is hard to control.
- It puts out chemicals into the soil and can shade out whatever was there before it occupied the area.
- It also very aggressively spreads after fires, making it a dangerous invasive in areas where prescribed burns occur.
- Spread - Via rhizomes and seed.

Control

- It is best to use aminopyralid in sandy soils due to chemical leaching from clopyralid.
- Basal bark - Using oil plus aminopyralid or clopyralid in a basal bark application for smaller (less than eight inches in diameter) trees is effective. Adding triclopyr can increase the effectiveness of this treatment.
- Girdle and treat - Use a chainsaw to girdle larger trees in fall or winter and spray aminopyralid or clopyralid with oil into the girdle left behind. Cut through the entire outer live bark to make the treatment effective. Follow up foliar treatments may be needed the next year(s) to kill respouts. Adding triclopyr can increase the effectiveness of this treatment.
- Foliar spray - Use aminopyralid or clopyralid in water to treat smaller trees less than eight feet tall.
- Cut stem - Cutting small trees and treating stumps with aminopyralid or clopyralid may also be effective. Adding triclopyr can increase the effectiveness of this treatment.

Buckthorns (*Rhamnus cathartica, Rhamnus frangula)*

Damage to SNAs

- Overshading, killing native understory plants and trees.
- Removing fuel from wetlands and prairies which prevents fire.
- Rubbing on larger trees resulting in branch kill and sometimes death.
- Prolific resprouter after being topkilled.
- Glossy buckthorn (*R. frangula*) is more likely to threaten wetlands and mesic prairies.
- Common buckthorn (*R. cathartica*) is more likely to threaten shaded environments like oak savannas, woods, etc.
- Spread - Birds eat and disperse seeds due to its laxative fruit.

Control

- Look for buckthorn populations in the fall (October-November) when it is still holding green leaves and other trees and shrubs have dropped their leaves.
- Stump treatment - Cut buckthorn and apply triclopyr with oil in fall and winter.
- Other methods may be successful- girdling, basal bark treatment or foliar spray with triclopyr.
- Prescribed fire - Burning in areas with sufficient fuel load to carry fire kills young seedlings. Repeated prescribed burning can topkill buckthorn trees and resprouts, setting them back, but they will be persistent.

Bush Honeysuckles (*Lonicera spp.*)

Damage to SNAs

- Prefers edges to full sun where it displaces other species through shading. But tolerates most light conditions and can be a problem in prairies, barrens, oak woods, etc.
- Spread - Birds eat and spread the seeds.

Control

- Stump treatment - Apply a glyphosate and water mixture to cut stems. Or when spraying buckthorn or other brush species use a 25% triclopyr and oil mixture with 5% glyphosate added in.
- Foliar spray - glyphosate in water is effective for smaller (less than eight feet) plants.
- Prescribed fire - Burning can topkill plants but they will resprout. Repeated burns can topkill large honeysuckle depending on intensity. Burning when plants are leafed out is more effective at topkilling honeysuckle. Pairing foliar spraying resprouts after repeated prescribed burning can result in complete control.

Canada Thistle (*Cirsium arvense*)

Damage to SNAs

- Can invade disturbed areas very quickly but also poses threats to wetlands and wet prairie where it can be persistent.
- Spread - Canada thistle is a clonal thistle that spreads vegetatively and via light wind-blown seeds.

Control

- Foliar spray - Using aminopyralid or clopyralid is an effective spot treatment of Canada thistle.

- Mowing - Mowing can be effective if cutting low to the ground the first week of flowering. After the first week of flowering viable seed may be produced by the cut stems. A second or third mowing treatment may be needed to prevent a second flowering period. Repeat mowings for several years.

Cattails- Narrow-leaved Cattail (*Typha angustifolia*) and Hybrid Cattail (*Typha x glauca*)

Damage to SNAs

- Aggressive colonizer of wetland ecosystems. It easily takes over disturbed wet areas and can spread into higher quality wetland communities forming dense monocultures.
- Fire seems to encourage spread.
- Spread - New individuals establish from seeds which disperse via wind. Those individuals spread via thick rhizomes to form dense colonies.

Control

- Mowing - A combination of mowing and flooding can prove effective at discouraging cattails from growth as the rhizome system is dependant on green and brown leaf material for oxygen.
- Foliar spray - In monocultures an aquatic approved herbicide like imazapyr can have positive effects. Since imazapyr kills everything, other methods may be more appropriate when native vegetation is mixed in.
- Hand wicking - Pair a cheap fuzzy glove outside with a chemical glove on the inside for this method. It can be effective at eliminating more scattered individuals. A container of herbicide is carried, the glove is dipped in the container and wicked on the cattail stem to apply the herbicide.

Common Reed Grass (*Phragmites australis*)

Damage to SNAs

- Forms tall, dense clonal colonies that form monocultures and displace other native plants and animals. Preferred habitats are wetlands, shorelines, and roadsides.
- Hybridizes with the native common reed grass (*Phragmites australis subsp. americanus*), increasing the aggressiveness of the native. While a plant tissue sample is the only way to tell for sure whether a plant is native or non-native, this article compares the typical characteristics of the two: http://www.nps.gov/plants/alien/fact/pdf/phau1-powerpoint.pdf
- Spread - Primarily via rhizomes which can take over areas quickly.

Control

- Bundle and cut - This method is an effective way to minimize effect on native plant species. Tie stems together in the late summer to early fall after flowering with twine at chest height. Cut stems off above the twine and apply imazapyr (or glyphosate) to the cut stems. Herbicide travels to the root system and kills the clone.
- Foliar spray - Apply imazapyr (or glyphosate) to stems after flowering but before 50% brown up in September- early October.
- Follow-up treatments are often necessary.
- Mowing or burning in the winter/early spring makes herbicide treatment easier by removing standing old plant material. Plants should not be mowed or burned six weeks prior to treatment or two weeks after treatment.

Crown Vetch (*Coronilla varia*)

Damage to SNAs

- Aggressive invader of disturbed and remnant open areas, shading out and displacing natives.
- Since it was often planted on roadsides it can invade from this starting point.
- Spread - This perennial spreads by rhizomes and abundant seed.

Control

- Foliar spray - Aminopyralid is effective at controlling crown vetch before flowering in summer or in the fall. Damage to other natives can be minimized by spraying in spring or early summer.
- Mowing - Mow before seeds are produced (early June) and mow a second or third time as plants leaf out. Mowing will not control, but does suppress crown vetch.
- Prescribed fire - Burning in late spring can control seedlings and small individuals but older plants will respond aggressively.

Dame's Rocket (*Hesperis matronalis*)

Damage to SNAs

- Displacing native plants in edges or semi-open environments.
- Produces a large number of seeds per plant.
- Dame's rocket is a biennial, it germinates and overwinters the first year. In the second year it produces flowers, seeds, and then dies.
- Spread - Seeds are dropped closely to parent plant but are dispersed by water, animal fur, or hooves.

Control

- Hand pulling - Persistent hand pulling of second year plants is effective.
- Foliar spraying - Spring spraying (May- early June) before seeds are produced with triclopyr. Spray early to minimize damage to natives and pair with hand pulling when the plants are flowering to get any missed individuals.
- Prescribed fire - Late spring or fall burning can kill germinated first year plants and some second year plants.

European Marsh Thistle (*Cirsium palustre*)

Damage to SNAs

- A biennial, it flowers and produces seeds the second year of growth, then dies.
- Aggressive colonizer in moist, acidic soils especially beach and dune areas of northern Wisconsin. Can displace native plants.
- Spread - Seeds dispersed by wind.

Control

- Mowing - Repeated mowing (3 times a year) can weaken second year plants if mowed just before buds begin to open.
- Foliar spraying - Spray with aminopyralid.

Garlic Mustard (*Allaria petiolata*)

Damage to SNAs

- Very aggressive, becoming a monoculture in some areas by displacing native plants.
- Produces a large number of seeds per plant.
- Injects a fungus killing toxin into the soil which decreases the competitive advantage of native plants.
- Garlic mustard is a biennial, it germinates and overwinters the first year. In the second year it produces a flower, seeds, and then dies.
- Spread - Seeds are dropped closely to parent plant but are dispersed by water, animal fur, or hooves.

Control

- Hand pulling - Persistent hand pulling (late April- June) of second year plants can be effective. It is beneficial to return to areas a second time to catch any previously missed plants or late bolting individuals.
- Foliar spraying - Spring spraying (early April- May) before seeds are produced with triclopyr. Spray early to minimize damage to natives and pair with hand pulling when the plants are flowering to get any missed individuals.
- Prescribed fire - Late spring or fall burning can kill germinated first year plants and some second year plants, depending on fire intensity. Seeds may germinate very well after burns, making follow up treatments important.
- Propane torch - A torch mimics fire and may be effective for larger patches of first year and small second year plants. Only use when conditions are too damp for the fire to spread.

Japanese Hedge Parsley (*Torilis japonica*)

Damage to SNAs

- Displacement of native plants due to aggressive spreading.
- Japanese Hedge Parsley is a biennial, it germinates and overwinters the first year. In the second year it produces a flower, seeds, and then dies.
- Spread - Via fuzzy seeds that stick to animals fur and clothing. Consequently, it travels quickly on deer trails, roads, brush edges, or other rights-of-way.

Control

- Foliar spray - Broadleaf herbicides are effective in the spring on first year plants.
- Hand pulling - The flowering or bolting plants are fairly easy to pull with gloves.
- Cutting - Since hedge parsley is a biennial, cutting low to the ground from peak flowering stage until brown fruit are present is an effective way to kill the plant and prevent viable seeds from forming.

Japanese Knotweed (*Polygonum cuspidatum*)

Damage to SNAs

- A woody perennial that forms dense thickets which shade out other plants especially along waterways.
- Spread - Primarily via rhizomes, but new populations can start from small root or stem fragments. Since plant fragments establish easily it is important to eradicate knotweed as soon as possible to prevent spread.

Control

- Knotweed is challenging to control so there is a lot of information on different methods.

- Mowing - Repeated monthly mowing can reduce root reserves. This method is best paired with other methods.
- Foliar spray - Aminopyralid or imazapyr sprayed in the fall may be effective for larger populations. A better method is to cut the plants when they are 4-5 feet tall and spray when resprouts reach three feet in height in the fall.
- Cut stem - During the growing season glyphosate can be effective on cut stems.
- For more information see http://www.clark.wa.gov/weed/

Leafy Spurge (*Euphorbia esula*)

Damage to SNAs

- Leafy spurge outcompetes natives even in remnant areas. Prolific spreader in open areas, very common on roadsides, and hard to control.
- Spread - Primarily via rhizomes, some seed dispersal as well.

Control

- Foliar spray - Application of aminocylopyrachlor + chlorsulfuron at 0.15% in the fall (late August to October) before the first frost is the most effective treatment. This application should be made after good soil moisture is present but prior to the leafy spurge losing its milky sap flow due to a killing frost. To check and see if the milky sap flow has been affected by a frost simply break the main stem of the leafy spurge and if milky sap flows from the break then aminocylopyrachlor + chlorsulfuron can still be applied.

Multiflora Rose (*Rosa multiflora*)

Damage to SNAs

- This rose can become a thicket of thorns in oak savannas, oak woods, and some prairies, shading out competitors.
- Spread - Rose seeds (or hips) drop close to the parent plants but are also spread via birds and animals that eat the hips.

Control

- Hand control - Scattered individuals can be dug out in newly invaded areas. It is important to get all of the roots. Plant native seeds quickly to control soil erosion.
- Mowing - Mow every 4 to 8 weeks for 3 to 6 times each growing season. If repeated for two to four years, mowing can be effective at controlling multiflora.
- Foliar spray - Foliar spray with metsulfuron-methyl in water is most effective.
- Cut stem - If you dare confront the thorns, cut stem treatment with triclopyr in oil is effective also.

Oriental Bittersweet (*Celastrus orbiculatus*)

Damage to SNAs

- Very aggressive vine which invades shaded to open environments. Kills native plants through shading. Can kill mature trees by shading or girdling them.
- Spread - Bittersweet is clonal, spreading vegetatively and via bird dispersal.

Control

- Look for new populations shortly after peak fall foliage because bittersweet hold its leaves longer than most native trees and shrubs.
- There is a native bittersweet (*Celastrus scandens*) which is very similar except for aggressive nature. Some differences between the two include flower and fruit position as well as fruit color. Use this link for help: http://www.mda.state.mn.us/plants/badplants/orientalbittersweet/bittersweetdiffs.aspx.
- Foliar spray - Use triclopyr mixed with water for control. Spray in the fall for easier ID and less damage to native vegetation. Some sources suggest spraying immediately after the first frost. Our crews have found spraying earlier than the first frost is also effective.
- Cut stump - Cut stems and apply a solution of triclopyr in oil to each stem. Watch for resprouts the next year.
- Prescribed fire - Research has shown that fire stimulates its growth. Fire can kill small individuals and seedlings, and can topkill clones- keeping them from travelling into the canopy, however resprouting will occur rapidly.
- Be persistent. Expect a need for follow up treatments.

Purple Loosestrife (*Lythrum salicaria*)

Damage to SNAs

- A threat to wetlands, purple loosestrife can infiltrate rich to poor quality wetlands, displacing natives in the process.
- Spread - Via rhizomes and seeds.

Control

- Bio-control - *Gallerucella* beetles are very effective at reducing large populations to manageable levels.
- Pulling - Can be effective on younger plants if the entire root is removed. Look for plants to flower in late July or August. Bag and remove pulled material.
- Foliar spray - Remove and the flower heads of the plant and use a brush or glove method to wipe the plant with 0.3% imazapyr. Bag the heads if there are seeds present.
- Cut stem - Cut the plant close to the ground, bag and remove the stem material, and apply a 2% solution of imazapyr to the cut stem.
- Prescribed fire - Fires may kill seedlings and suppress mature plants but have not been shown to control populations. Other methods are needed.

Reed Canary Grass (*Phalaris arundinacea*)

Damage to SNAs

- Spreads quickly in wetland and some upland habitat displacing natives. Seeds spread along waterways and streams and established patches spread by rhizomes. It really likes wetland areas with high nutrient content- typically areas with lots of runoff like floodplains of streams or wetlands.
- Spread - Primarily vegetative but some seed spread as well.

Control

- Foliar spray - Control is difficult as follow-up treatments are needed. Glyphosate is very effective, but not selective, so best used in dense stands lacking desirable plants. Clethodim is selective and will not kill dicot or sedge species but is not approved for aquatic use and cannot be used near water. Clethodim is most

effective in spring or fall. Treatments at this time of year tend to minimize the impact on any natives in the area.

- Hand wicking - Pair a cheap fuzzy glove outside with a chemical glove on the inside for this method. It can be effective at eliminating individuals without impacting native vegetation. A container of herbicide is carried, the glove is dipped in the container and wicked on the grass stem to apply the herbicide.
- Prescribed fire - Repeated late spring burning (for five years) has been shown to be effective in reducing populations.

Spotted Knapweed (*Centaurea maculosa*)

Damage to SNAs

- Aggressive in open disturbed and remnant dry areas especially sandy and rocky sites.
- Spread - Seeds drop close to the plant but remain viable in the soil for many years (eight or more).

Control

- Pulling - Pulling or cutting below the soil can keep a small population at bay if the top 3 inches of taproot are removed, but is not an efficient way to control large infestations. It is best used in sensitive areas or with other methods.
- Foliar spray - Apply a broadleaf specific herbicide like 2,4-D to plants in the spring, when bolting, or in the fall. Milestone (aminopyralid) is extremely effective at the same times of year for knapweed and has a multiple year residual effect. Spraying in fall or early spring minimizes damage to native plants. Rosettes remain green into winter and spraying can be effective when temperatures are above 35 degrees.
- Mowing - Large patches can be mowed at peak flowering but the plants may resprout, so they need to be monitored to see if a second cutting is needed. This is not the most effective control since it does not kill the plants, but a year's seed supply can be removed this way.
- Prescribed fire - A late spring fire may control small individuals and suppress established plants. The most effective time for control is during summer when plants are flowering, but this may harm other species as well. At least three years of annual burning are needed to suppress populations.

Yellow and White Sweet Clover (*Melilotus spp.*)

Damage to SNAs

- Easily colonize recently opened or disturbed areas from full sun to partial shade. Yellow sweet clover is less shade tolerant. Can remain in and overtake remnant prairie areas.
- Persist well in the seed bank.
- These plants are biennials which germinate in the first year and produce flowers and seeds the next year after overwintering. After this flush of seed production the plants die.
- Spread - Small seeds that fall close to the parent plant are transported by animal fur and feet.

Control

- Cutting - This method is commonly used for large areas and can be very efficient with a mechanical brushcutter. Cut the plant close to the ground at peak flowering, just as the very first seeds are starting to form. The plant will die since all of its resources are put into creating flowers. Watch for yellow sweet clover to bloom in early June, white sweet clover in early July.
- Pulling - Remove the root to ensure the plant will not resprout. Sweet clovers have large taproots and may be difficult to remove if waiting till flowering. Pulling can be done before the plants flower.

- Prescribed fire - Fires scarify clover seeds, encouraging them to germinate. Expect a flush of sweet clover one- two years after a burn. Two years of burning with the second burn conducted in late spring burning is thought to help control sweet clover.
- Foliar spray - A broadleaf herbicide (aminopyralid is most effective) provides control, but may cause damage to natives in quality areas.

Wild Parsnip (*Pastinaca sativa*)

Damage to SNAs

- Persistent in low quality and disturbed open areas.
- Able to invade remnant wetlands and prairies.
- Wild parsnip is a biennial or monocarpic. It doesn't flower the first year it germinates. It stays in rosette form for a year or more before flowering. After flowering and producing seed, the plant dies.
- Spread - Via seeds that are dropped close to the parent plant.

Control

- Be aware of the phototoxic nature of wild parsnip. When the sap from the plant contacts bare skin and the skin is exposed to sunlight a painful rash develops. Some people are more sensitive than others.
- Pulling - Hand pull or cut below the root crown (just under the soil) to kill plants. Bag any seed material.
- Cutting - Mow or cut plants that are at full flower stage, before seeds enlarge, close to the ground. Since the plant will die after producing seeds, this will prevent seeds from developing and kill the plant. Resprouting will occur if the plant was cut too early.
- Foliar spray - Use a broadleaf specific herbicide such as metsulfuron-methyl (best option) 2,4-D amine, or triclopyr for control.

For more information try these helpful links on invasives:

Midwest Invasive Plant Network (MIPN): http://mipn.org/

Invasive Plants Association of Wisconsin (IPAW): http://ipaw.org/

Wisconsin DNR Invasive Species Information:
http://dnr.wi.gov/topic/Invasives/what.html

Recreational Best Management Practices (BMPs) to limit invasive spread:
http://www.wisconsinforestry.org/initiatives/other/invasive-species-bmps/recreation-bmps

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